UNIVERSITY OF ALBERTA

CMPUT 497/500

Foundations of Program Analysis

Karim Ali
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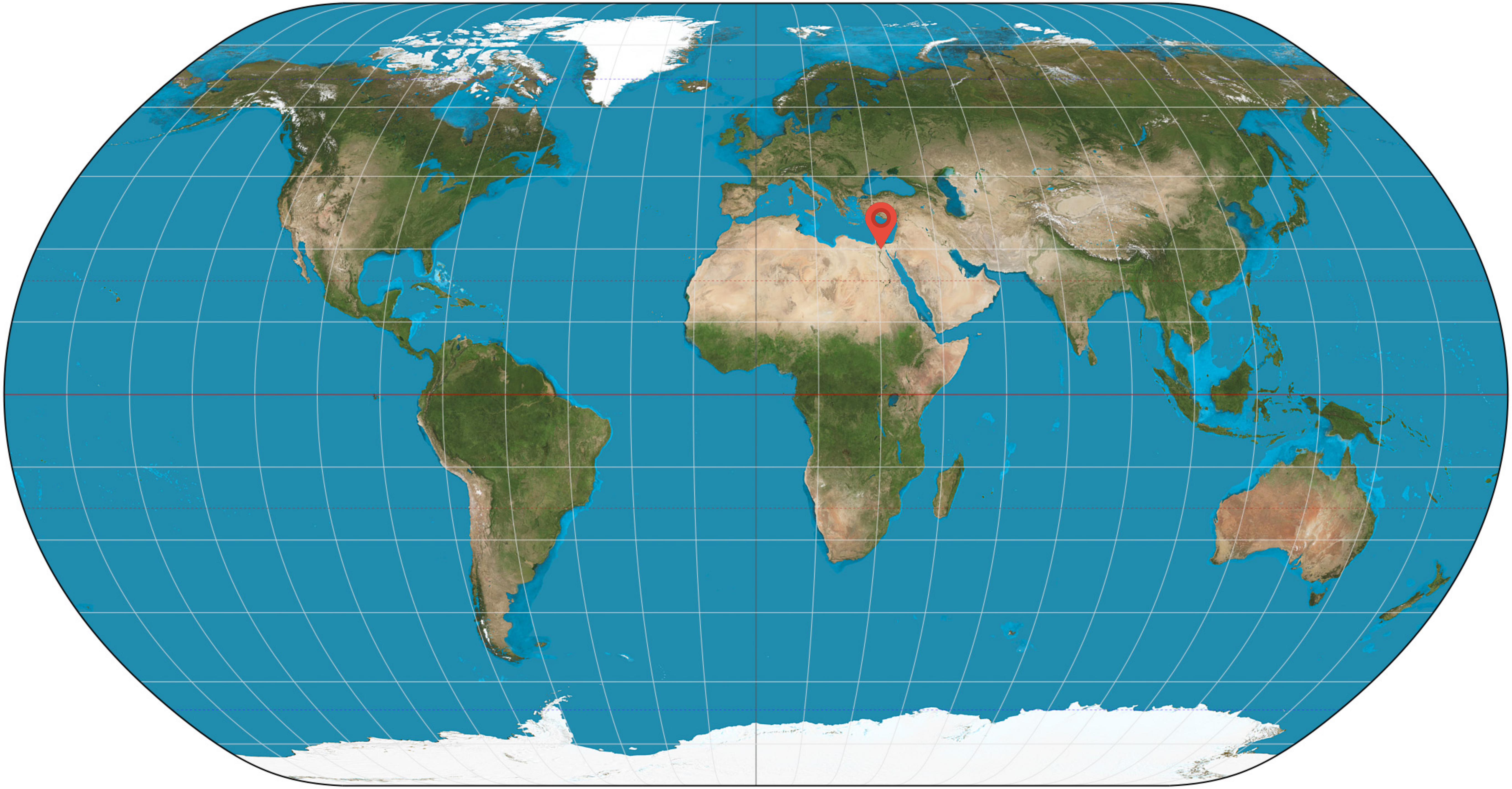
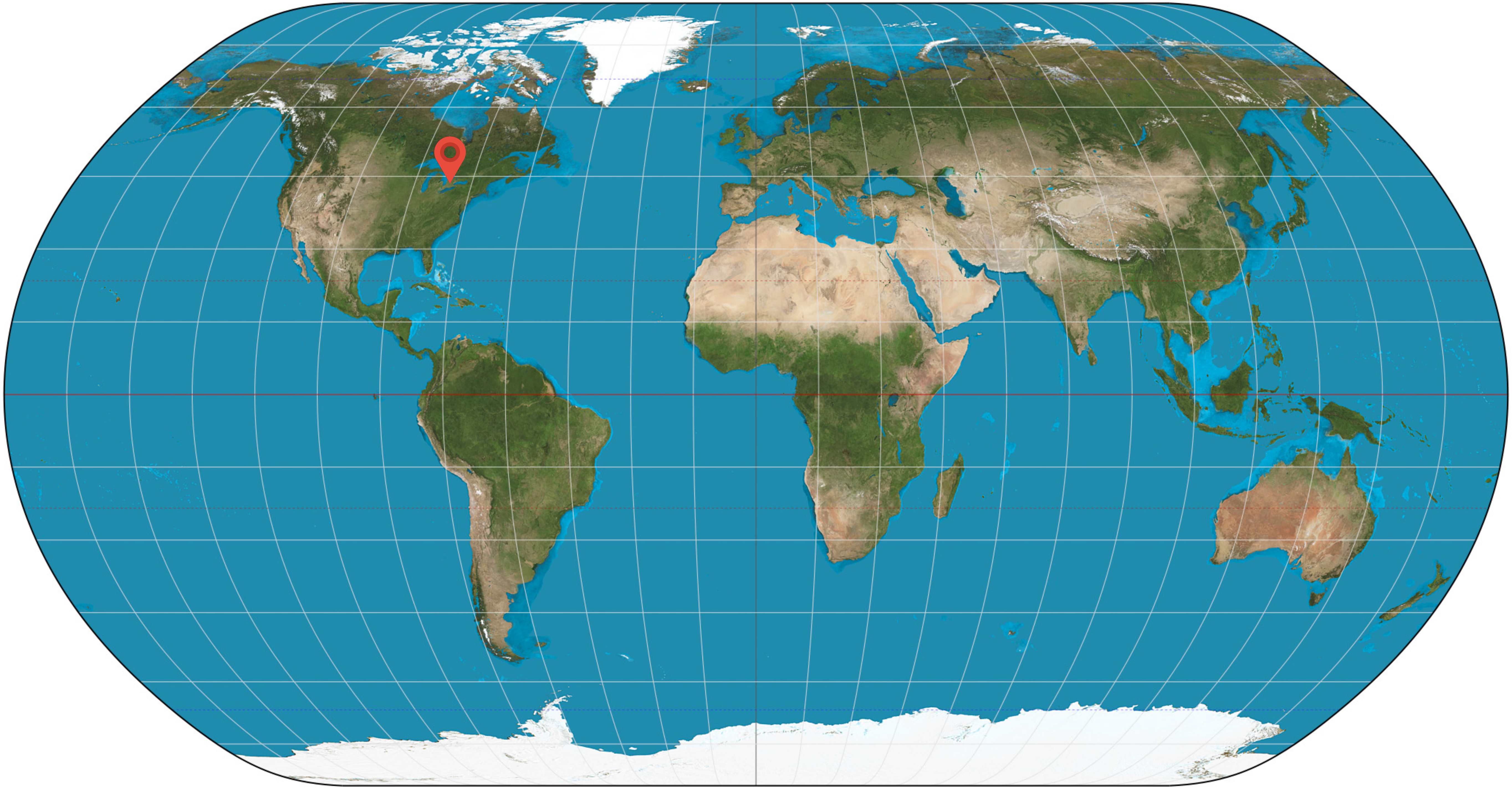
January 8, 2019
BS - M 141

Bachelor’s in Egypt
2003 — 2007



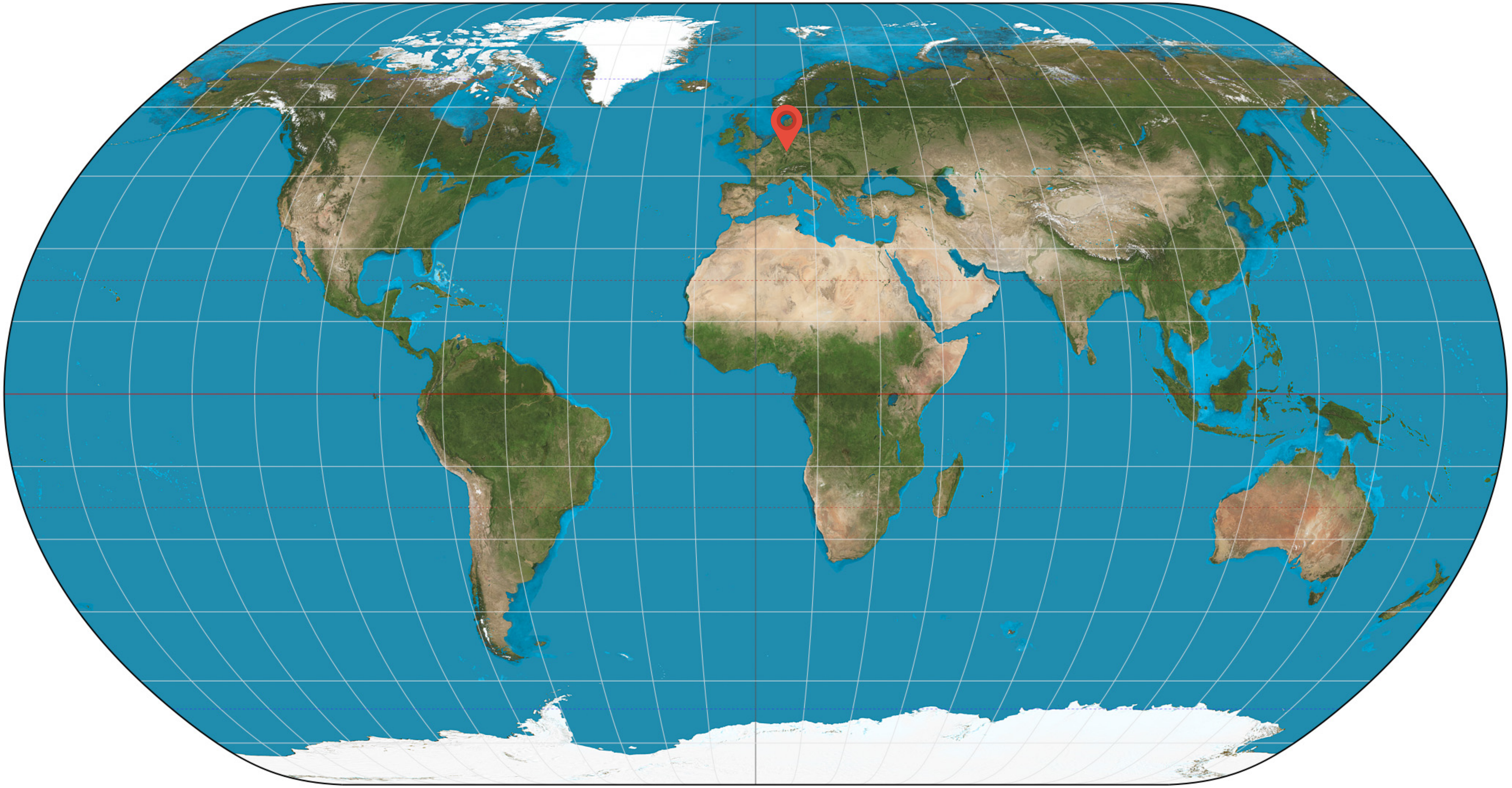
Master’s & Ph.D. in Canada
2008—2014

UNIVERSITY OF WATERLOO
CONCORDIA CUM VERITATE



Postdoc in Germany
2014—2016

TECHNISCHE
UNIVERSITÄT
DARMSTADT



Assistant Professor 2017—???

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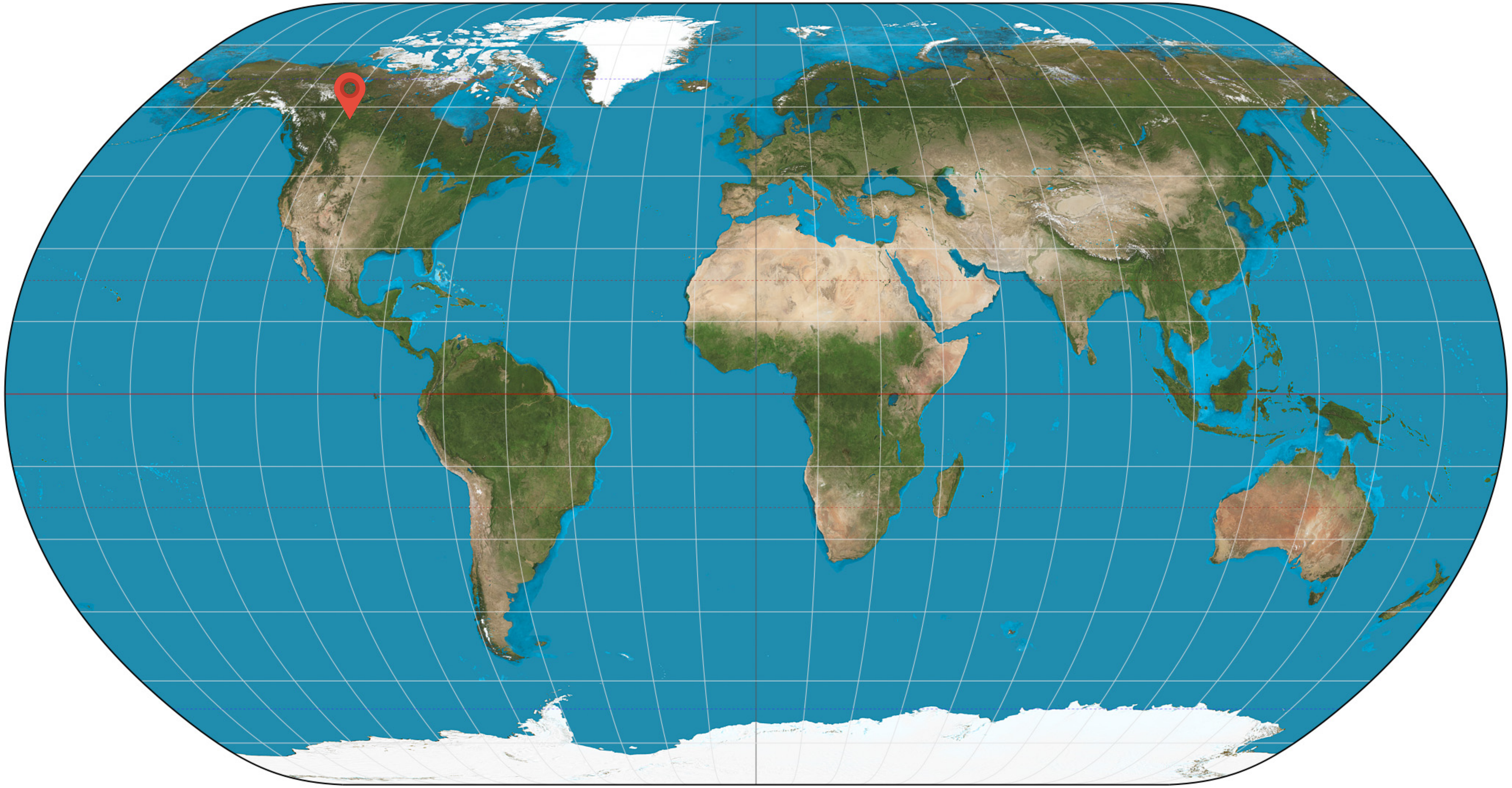
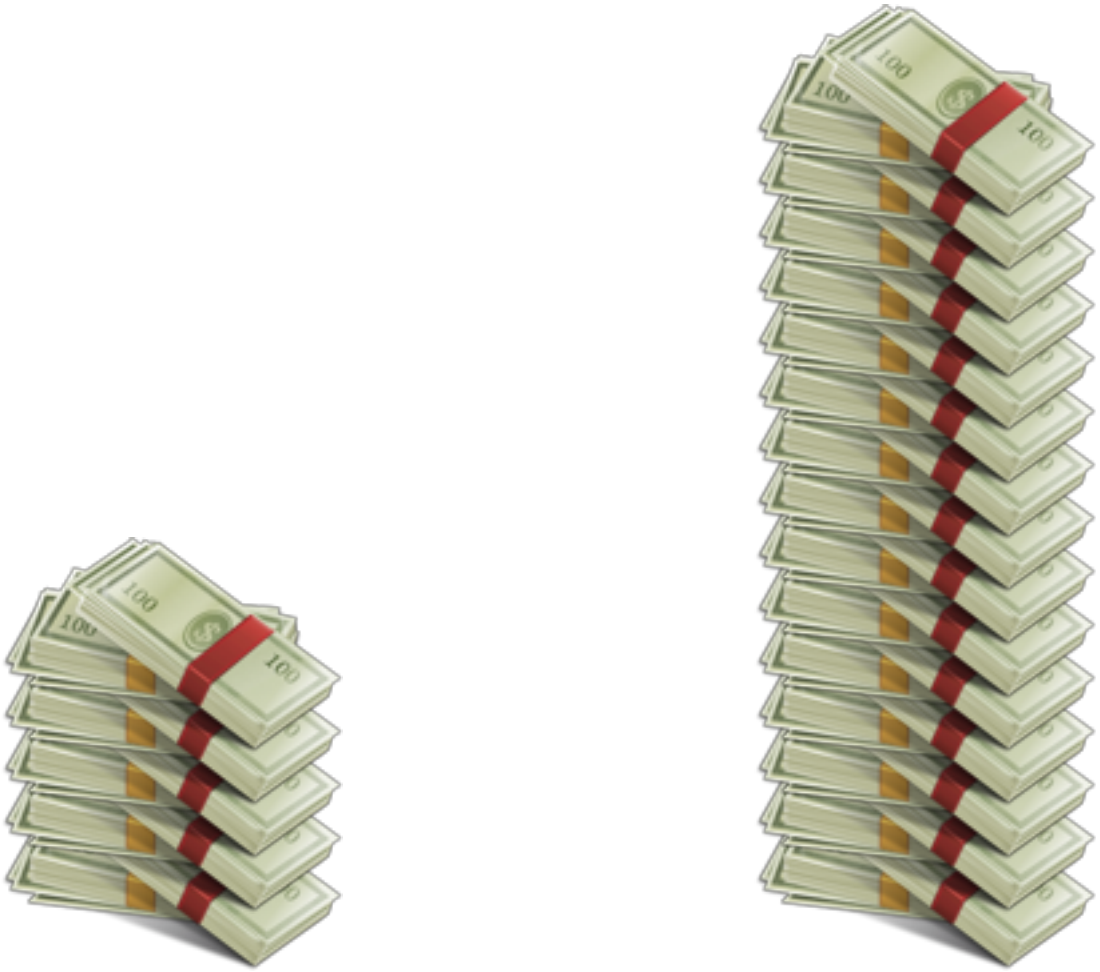


What about you?

Cost of Software Bugs?



```
static OSStatus
SSLVerifySignedServerKeyExchange(SSLContext *ctx, bool isRsa, SSLBuffer signedParams,
                                 uint8_t *signature, UInt16 signatureLen)
{
    OSStatus        err;

    ...

    if ((err = SSLHashSHA1.update(&hashCtx, &serverRandom)) != 0)
        goto fail;
    if ((err = SSLHashSHA1.update(&hashCtx, &signedParams)) != 0)
        goto fail;
        goto fail;
    if ((err = SSLHashSHA1.final(&hashCtx, &hashOut)) != 0)
        goto fail;

   err = sslRawVerify(ctx,
                       ctx->peerPubKey,
                       dataToSign,                /* plaintext */
                       dataToSignLen,             /* plaintext length */
                       signature,
                       signatureLen);
   if(err) {
       sslErrorLog("SSLDecodeSignedServerKeyExchange: sslRawVerify "
                    "returned %d\n", (int)err);
       goto fail;
   }

fail:
     SLFreeBuffer(&signedHashes);
    SSLFreeBuffer(&hashCtx);
    return err;

}
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Apple’s goto fail!

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```
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US $3 Billion

TOYOTA

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Medtronic
Alleviating Pain · Restoring Health · Extending Life

```
goto fail;
goto fail;
```

TOYOTA

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Program Analysis

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Alleviating Pain · Restoring Health · Extending Life

What is Program Analysis?

Program Analysis

A way of understanding the runtime behaviour of a program without necessarily executing it

Code Navigation

Code Refactoring

Code Recommenders

Program Analysis

Parallelization

Constant Propagation

Static Inlining

Dead Code Elimination

CHECKMARX

Sources

Sinks

coverity®

A Synopsys Company

FORTIFY

AbsInt

Topics

- Intro + Fundamentals
  - IR
  - Intra-Procedural Analysis
  - Call Graphs
  - Pointer Analysis
  - IFDS/IDE
  - Usability of Analysis Tools
- Seminars
  - Developer Support
  - Android Security
  - Distributed Static Analysis
  - Dynamic Languages
  - Probabilistic Programs
  - Program Synthesis

This Course

- Mix of lectures and in-class hands-on
- Assignments
- Seminars
- Course project

eClass

https://eclass.srv.ualberta.ca/course/view.php?id=49092